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ABSTRACT

To meet the changing needs of students, teachers and schools need to create a more visually stimulating learning environment. The modern needs of visual learners can be met through students creating hypermedia stacks that can be viewed and heard by both teachers and students alike. The visual images, sights, and sounds provided in these resources can have a positive impact on student learning, retention, motivation, attention, and achievement. This study investigates the effects of HyperStudio--a multimedia authoring tool--on the achievement of seventh grade social studies students. After approximately three weeks, the students (n=17) who were instructed using HyperStudio did not achieve statistically significant higher scores on the post-test than the students (n=17) whose instruction did not include HyperStudio. The study showed that the HyperStudio instruction method was not effective in raising the achievement level of the participating students. However, students in the experimental group had a more positive attitude toward learning, their partner, and cooperative learning. Appendices include: sample experimental lesson plan; demographic survey; attitudinal questionnaire and scoring key for both the experimental and control groups; and pre- and post-test grades and results. (Contains 43 references.) (SWC)

THE EFFECTS OF HYPERSTUDIO ON THE ACHIEVEMENT OF SEVENTH GRADE SOCIAL STUDIES STUDENTS

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Abstract

The purpose of this study was to investigate the effects of HyperStudio on the achievement of seventh grade social studies students. Using a pretest/posttest control group experimental design and a t test for independent samples, it was found that after approximately 3 weeks the students (n = 17) who were instructed using HyperStudio did not achieve statistically significantly higher scores on the posttest than the students (n = 17) whose instruction did not include HyperStudio, t (36) = 1.26, $p > .05$. It was concluded that the HyperStudio instruction method was not effective in raising the achievement level of the participating students. However, students in the experimental group were found to have a more positive attitude toward learning, their partner, and cooperative learning.

Introduction

As society changes schools must adapt to the changing nature and needs of students. To meet this end teachers and schools need to create a more visually stimulating learning environment. One way in which the modern needs of visual learners can be met is through students creating hypermedia stacks which can be viewed and heard by both students and teachers alike.

In recent years, with the proliferation of laser video disks, CD-ROMs, and other educational software the study of social studies has come alive for students. The visual images, sights, and sounds provided in these resources can have a positive impact on student learning, retention, motivation, attention, and achievement. For example, through multimedia enhanced instruction students can see Neil Armstrong walking on the moon, Walter Cronkite reporting the Kennedy assassination, or the liberation of a Nazi Holocaust camp all with the click of a mouse. However, one drawback with this type of visual material is that teachers and students only have limited control over the material being presented. While some materials may claim to be "interactive" the user is really in a passive state, only having a limited degree of control over their learning by selecting certain topics to study in this hypermedia format.

Students need to develop the ability to think for themselves, apply concepts that they learn, and analyze and evaluate the material that they study. To put it simply, students need to be able to synthesize information, construct knowledge, and ultimately learn how to think for themselves. By implementing an innovative and technological approach to learning these goals can

be readily obtained through student created hypermedia presentations.

This experimental study will address the use of HyperStudio (a multimedia authoring tool) in the seventh grade social studies classroom. HyperStudio will be used as an interactive hypermedia programming environment.

Statement of the Problem

The purpose of this study was to investigate the effect of HyperStudio on the achievement of seventh grade social studies students. Robert Wagner's HyperStudio is a hypermedia authoring tool that allows users to create multimedia projects. Hypermedia is defined as software that allows animation, video, graphics, sound, and text to be linked in meaningful ways (Hasselbring, Goin, & Wissick, 1989). This study will focus on the question: Will seventh grade social studies students who create their own HyperStudio stacks have a statistically significant higher score on a criterion referenced textbook published test than students instructed with traditional methods?

Review of Related Literature

Educational theorists have suggested that tomorrow's generation of students will be more visually literate compared to their primarily text literate parents (Erikkson, 1988). It is quite possible that visual instruments such as television, video games, laser disks, and computers could have a positive effect on a student's success and approach to visual learning via computer education (McGraph, 1992). As a study on metacognition and computer use among fourth grade students has already suggested: one of the most vivid metacognitive processes evident among the

fourth grade students was their visual literacy in creating computer based multimedia animations (Ollila, Schwartz & Francis, 1993).

In the 1990s the use of computers in school and at home has grown dramatically (Brennan, 1992). It is imperative that educators make use of the unique characteristics of the computer that have the potential to make computer aided instruction such a powerful tool for student learning (Nelson, 1987; Privateer & MacCrate, 1992).

Many who study the effects of multimedia and computers on student achievement claim that that there is no statistically significant increase in student achievement when compared to students who went through a traditional instructional program. Verhagen (1996) argues that any increases that occur during the multimedia enhanced instruction should be attributed to the "novelty effect" of multimedia as an instructional tool. This suggests that the "newness" ability of multimedia materials to capture ones attention is what causes the increase in student learning. Furthermore, other evidence suggests that some students do better with technology as a learning tool because they find it preferable when compared to a traditional classroom situation (Aiken, 1992).

In contrast to the aforementioned studies, computer based instruction using multimedia materials for military training purposes have been found to improve military performance in real life situations. The study also found that the technologically enhanced training reduces risk and injury to military personnel

and equipment while allowing for "higher levels of achievement." (Unwin & McAleese, 1988, p. 401).

The implementation of multimedia enhanced learning has shown increased student achievement in colleges in Alabama and Florida (Dempsey & Rasmussen, 1993), as well as European universities (Davies & Pritchard, 1993). These studies reveal substantial benefits to multimedia instruction and its use as an instructional tool in having a positive effect on student achievement at the college level.

Studies have shown that students obtain 80% of their knowledge visually, but retain only 11%. While a smaller percentage of information is acquired through hearing, more is retained. Howard Walter, Vice Provost for Research Computing at Carnegie Mellon has suggested that multimedia is most effective when audio-visual media is combined, increasing retention to 50% (Laszlo & Castro, 1995).

Further information has been collected that shows people retain between 25% to 50% more, have a 60% faster learning curve, and reach the mastery level 50% to 60% faster with multimedia enhanced instruction when compared to without it (Forman, 1995). While the aforementioned numbers certainly vary, many studies suggest that achievement and retention both increase with the aid of multimedia enhanced teaching. This leads to the conclusion that student achievement will increase when the methodology of instruction includes multimedia based lessons, activities and projects.

Early studies regarding multimedia software in elementary and secondary education have focused on integrating professionally

designed, prepackaged multimedia materials and software into the classroom as a cognitive tool (Rowe, 1993). According to this "applicationist" school of multimedia implementation, teachers should purchase multimedia titles that correspond to the classroom curriculum. The multimedia software would than be "applied" to the area of study to enhance student understanding of a particular topic. For example, in the HyperCAP Project, Jennings (1994) suggests that professionally designed HyperCAP stacks could be used as enrichment material to compliment an already existing textbook to give emphasis to multicultural material not covered in traditional textbooks. In another case a teacher may utilize MECC's Oregon Trail as an instructional tool in a social studies lesson on westward expansion. In essence, under this model the computer replaces what is done with traditionally used papers, pencils, and books (Lacy & Wood, 1993).

Other studies have focused on how teachers could create their own multimedia stacks for students to use in the classroom as a tool for students to apply to traditional learning methods (Jonassen, 1986; Bowers & Tsai, 1990). This type of multimedia implementation required more knowledge on the part of the classroom teacher. The teacher was no longer merely "applying" multimedia, but "creating" multimedia presentations and then "applying" the presentations to course content in meaningful ways (Landow, 1989).

In his seminal work on computers in education, Taylor (1980) described three major functions of computer usage: computers could be used as a tutor to help students understand difficult concepts; as a tutee to check student comprehension of concepts; and as a

tool that the student could use to create. The tool, or "creation" function of the computer has gained increasing acceptance with the advent of inexpensive and easy to use hypermedia authoring software (Hasselbring, Goin, & Wissick, 1989). Furthermore, Fabris (1992) has found that the use of a hypermedia authoring tool provides rich learning experiences for all students, regardless of cultural, social, economic, or ethnic background.

More recent studies have focused on students as hypermedia authors (Brigham, Hendricks, Kutcka, & Schuette, 1994). Hooley and Toomey (1993) have advocated that the computer could be used as a tool to store, share, and reconstruct knowledge through computer enhanced learning (CEL) via hypermedia applications. Pea (1991) has suggested that the real educational use of multimedia technology will not be realized until students are empowered to create their own multimedia projects to communicate their understanding and organization of the topic being studied. Pea's claims are further supported by Stevens (1993), who, in a study on computer software programs and student activities utilizing the computer to help teach secondary social studies, concluded that the successful use of computers in social studies instruction depends upon the design of student created projects.

This "constructionist" school of hypermedia is based on the belief that students should reconstruct their own understanding of their studies, and assume a more active role in their education (Papert, 1987; Nicol, 1989). Marchionini (1988) contends that when students create their own hypermedia stacks they present knowledge in a way that matches their own schematic framework of

understanding. These results are supported by other efforts. Ashton (1992) has suggested that when students reconstruct knowledge for themselves they tend to learn more because the information is internalized.

Bodner (1986) has argued that until recently the accepted model for instruction was based on the hidden assumption that knowledge can be transferred intact from the mind of the teacher to the mind of the learner. Bodner further claims that teaching and learning are not synonymous; teachers can teach and teach well, without having the students learn. Constructivism holds that the student identify topics or issues, locate resources, plan investigations and activities, and practice self-evaluation (all with teacher support). Under this model the emphasis is shifted from activities that teachers do, to those that students should perform (Von Glasersfeld, 1979).

Studies have found that after the initial introduction of students to the HyperCard authoring environment (HyperCard is similar to HyperStudio), student benefits can be overwhelming. As Velasco and Mendivil (1992) have reported: student motivation increases, the use of graphics, sounds, video clips, and peripheral devices for photographic material is very attractive for image-centered learning, and the hypermedia environment demands careful planning which implies the exercise of higher skills in structural design and thinking.

In a qualitative research study on multimedia authoring tools involving 37 seventh grade science students Turner and Dipinto (1992, p. 189) addressed the question "Would the students develop enough skill with HyperCard to complete their projects in a

reasonable period of time?" In this study students worked two to a computer in 35 minute sessions twice a week for eight weeks to create multimedia research reports as part of their seventh grade science curriculum. The researchers did not specify how the subjects for this experiment were selected.

The study used a qualitative research paradigm. Four sources of data were examined: 16 participant observations, 4 teacher interviews, 37 written student reflections, and analysis of 37 student created hypermedia stacks. No statistical test, pretest, or posttest was implemented.

Turner and DiPinto concluded that with 9 to 10 hours of hands on computer time seventh grade science students could successfully author HyperCard science reports that integrate text, videodisks, and scanned images. It was also concluded that the investment in time was worth the effort. The researchers also found that student interaction was positive, with one student assuming the role of a peer teacher in nearly every group. Furthermore, the hypermedia authoring tool gave students new perspectives on organizing information.

Turner and DiPinto also concluded that although the student created stacks provided evidence that students had learned about mammals, the hypermedia environment did not "seem" to enhance content learning any more than traditional reports with a word processor as students had done in previous years. Perhaps the conclusion would have been different if one group was designated as a control group and completed traditional reports and the other group was designated as the experimental group and completed HyperCard projects. A pretest and posttest, along with

a t-test could have than be used to compare differences in student learning and achievement.

In a similar descriptive experiment involving the constructionist use of hypermedia Volker (1992) hypothesized that students would more readily use primary source information if their goal was to create a hypermedia project. In this study students created the program design and content treatment for certain portions of the program. Uncompleted portions of the program were left in skeleton form so other students could complete them. In this study students served as program designers, while teachers served as content advisors. The study took place over a three month period. Prior to the field test participants completed attitudinal surveys on their attitudes toward technology, their fear of it, their level of knowledge before using the materials, and their preference for working on their own.

Following a field test 35 student users, 3 teachers, and 3 student producers responded to the formal survey instruments. When asked to compare traditional instruction (text books, television, field trips, etc.) students indicated hypermedia was more interesting and that they liked it better. Teachers also expressed enthusiasm for the motivational aspects of this approach, claiming that students showed more interest in math and science. Nearly all teachers recognized the shift from teacher centered instruction to student based learning. As the researcher points out, no rigorous determination was used to determine how much content was learned.

When used as a constructivist tool hypermedia authoring tools can significantly increase students ability to retain knowledge. Research has shown that students retain 20% of what they see, 40% of what they see and hear, and 70% of what they see, hear, and do (Geisman, 1988). Hypermedia projects are to be seen, heard, and done by students. By "doing" constructionist hypermedia projects students' achievement on tests and retention of information will likely improve.

As the more investigative research on student created multimedia projects has concluded, when used appropriately hypermedia has the potential to enhance student learning and subsequent achievement, as well as cognitive and social skill development (Collins, 1991; Carver, 1992; Wisnudel, 1994). This study will specifically look at HyperStudio and its effects on student achievement in social studies.

Statement of the Hypothesis

While little research has specifically focused on middle school social studies students and HyperStudio, research suggests that HyperCard has had positive effects on the achievement and motivation of middle school students. Therefore, it was hypothesized that seventh grade social studies students who create their own HyperStudio stacks will achieve a statistically significant higher score on a criterion referenced textbook published test than students instructed with traditional methods.

Method

Subjects

The sample for this study was selected from the population of seventh grade social studies students from a Middle School in Nassau County, Long Island. The total population contained 37 social studies students of average ability. The student population is approximately 90% white, and 10% "other." The sample for this quasi experimental study will be drawn from 34 subjects (18 males and 16 females) between the ages of 12 - 14.

The subjects for this study were selected from two classes of the researchers preexisting class schedule. The researcher recognizes the inherent bias in this subject selection methodology, but as a classroom teacher must conduct the experiment under actual classroom conditions. In this particular study random assignment was neither feasible nor possible due to the constraints of an operating school environment.

There was no significant difference in the demographic background of the two groups. All students characterized themselves as being middle class. Approximately 75% of students in each group own computers. Twenty five percent have Internet access or subscribe to an online service from their homes.

It is also important to note that the subjects selected for this study have all previously created HyperStudio stacks in math and social studies classes. On an average, students have spent 10 -15 previous hours working with HyperStudio and are aware of the major functions and capabilities of the software.

Setting

The control group met in a traditional seventh grade social studies classroom. The back of the room has one large bulletin board decorated with a previous student assignment and a map that can be moved to the front of the classroom when appropriate.

On certain days the students in the control group remained in rows, especially when taking notes or reviewing homework assignments. On other days a pair of students pushed their desks together to complete an assignment with a partner. An overhead projector was used for giving notes to the students in both the experimental and control groups.

Due to the technological nature of this experiment, the experimental group met in the Computer Lab . The Computer Lab contains 16 Macintosh computers, one laser printer, one color printer, one Macintosh ColorOne Scanner, and one projection device in the form of a 27 inch monitor. Ten of the Computers are Macintosh LC475 models with 4MB of RAM that run on System 7.0. Five newer models were added in September, 1996 when the lab expanded from 11 to 16 computers. These new computers are Power Macintosh's 5260/100 containing 16MB of RAM and CD ROM Drives. The Power Macintosh's operate on System 7.5.3. The lab contains one teacher's workstation with a Quadra 660/AV which contains 16MB of RAM. The Quadra was connected to a 27 inch monitor. All of the computers contain a copy of the HyperStudio software(Robert Wagner Publishing Company). All computers have the 2.0 version of HyperStudio installed.

The computer lab is in a constant state of flux with classes coming and going all the time. Students have previously visited the computer lab with their math, science, English, social studies, and technology classes. Students also attend computer classes for a half year with the class meeting every other day. With this in mind it is unlikely that the novelty of the new environment will have either a negative or positive effect on the students in the experimental group. Most students feel comfortable in the computer lab and consider it part of the natural, everyday school environment.

The computers in the computer lab are set up on tables around the perimeter of the room. Three tables form the center of the room. Here students are able to do other work should the need arise. The room also contains a blackboard that will be used for giving instructions and homework assignments. On four occasions throughout the experiment the experimental group met in the traditional classroom for the purpose of reviewing homework assignments and taking notes.

Both the experimental and control groups will meet in the late afternoon for a forty one minute period, five days a week. The study is designed to last three weeks. Students in both classes will work in pairs on their assignments (Appendix A).

Instruments

The effectiveness of HyperStudio on student achievement rates was determined by comparing the social studies achievement of the two research groups as measured by a textbook publisher created pretest and posttest using the Form A/Form B format. The

pretest and posttest that will be used was published by Prentice-Hall and corresponds to the middle school textbook entitled The American Nation (Prentice-Hall).

The American Nation offers teachers two different reproducible tests each chapter that relatively test the same body of knowledge; albeit different ways. Each test contains four parts: Key People, Places, and Terms (sentence completion with word bank and matching); Chapter Check-up (multiple choice); Using Your Skills (multiple choice); and Thinking About History (essay). The tests employ a variety of questioning strategies that require students to use higher order thinking skills as well as to recall knowledge. All levels of Bloom's Taxonomy are accounted for on the tests which accompany The American Nation. Although no coefficients were reported for validity the test was deemed valid by the Social Studies Supervisor in the district in which the experiment took place.

Using the pretest/posttest format, subjects completed a Form A Test prior to the implementation of the study and a Form B Test at the conclusion of the study. Both the pretest and posttest contained five sentence completion questions with word banks, five matching questions, ten multiple choice questions, five skill orientated multiple choice questions based on reading a map, and two essay questions. Students were given forty minutes to complete each test. The essays were graded by two scorers. A third scorer was to be used to mediate large scale differences in essay scoring; however, this proved to be unnecessary as no large scoring differences occurred. The publisher created answer key contains an essay grading rubric. In an effort to help ensure

maximum accuracy in reporting results this rubric was used by the essay scorers.

Other measuring instruments included a demographic survey (Appendix B) that students in both groups were asked to complete prior to beginning the study. Students were also asked to complete a researcher designed attitudinal questionnaire (Appendix C) regarding computer use and cooperative learning at the completion of the experiment. The purpose of these instruments will be to provide background information on the students attitudes and familiarity toward the use of computers and multimedia authoring tools.

Experimental Design

Students were selected to participate in this non equivalent quasi experimental study using a pretest/posttest control group experimental design (Appendix D). Subjects in both groups will be pretested prior to the treatment and posttested after the instructional unit using a test of social studies achievement (See Table 1).

The school in which this study will be implemented has a 98% attendance rate. Mortality, a potential threat to the internal validity of the study, was not a problem due to the short duration of the study (three weeks) and high attendance rate. The consistency of the groups is not expected to change throughout the course of the study with the exception of occasional daily absences from class.

In this study the presence or absence of HyperStudio instruction will be the independent variable. Student performance

on the cognitive assessment instrument will be the dependent variable.

Table 1. Experimental Design.

Group	Assignment	n	Treatment	Pretest	Posttest
1	class 1	17	HyperStudio Plus Regular Instructional Program	Form A	Form B
2	class 2	17	Regular Instructional Program	Form A	Form B

O X_1 O

O X_2 O

Procedure

In January, 1997 two seventh grade social studies classes were selected to one of two groups. One class was randomly designated to be the experimental group, while the other class comprised the control group.

The researcher taught the control group about the Age of Jefferson using a traditional method of instruction. This method included class discussions of the subject matter, homework

assignments, note taking, cooperative learning activities, student panel presentations, and lecture.

The researcher also taught the experimental group about the Age of Jefferson. The approach used with the experimental group was similar to that of the control group in that it involved class discussions of the subject matter, homework assignments, note taking, cooperative learning activities, student panel presentations, and lecture.

The main difference between the two groups was in the nature of the class projects that the groups complete. For example, students in the control group will complete more projects in concept mapping to journal writing, using traditional non-computer enhanced techniques. Students in the experimental group will create HyperStudio stacks pertaining to the Age of Jefferson that incorporate concept mapping and journal writing that use computer enhanced techniques.

Students in the experimental group will be familiar with the basics of HyperStudio and how to use a scanner. Due to the limited number of computers available in the computer lab students in the experimental group worked in pairs on their HyperStudio stacks. One stack was completed by each group of two students. The control group also completed their projects in pairs to prevent the student grouping variable from playing a major role in the results of this study.

Both groups were given 40 minutes to complete the pretest prior to the beginning of any instruction during their regularly scheduled class period. Students will take the test in silence.

The same conditions will be applied to the posttest after the completion of the unit of study.

Both classes were instructed by the same teacher. Learning objectives and tests for both groups were also identical. Both classes used the same textbook and were given the same homework assignments, reading assignments, worksheets, study guides, notes, and tests.

Results

At the beginning of the study, after the thirty-four students were assigned to the experimental or control group, a pretest was given in order to check initial group equivalence (Appendix E). Examination of the means and a t test for independent samples (@ =.05) indicated no statistically significant difference between the two groups (see Table 2). A t test for independent samples was used to compare the achievement for the experimental and control groups. This statistical technique was utilized because it was believed that the assumptions required for the use of the parametric t test were met, e.g., the data were interval.

At the completion of this three week study scores on the pretest and posttest were compared using a t test for independent samples (Appendix F). As Table 2 indicates the posttest scores for the control and experimental groups did not differ significantly. Therefore, the original hypothesis that "Seventh grade social studies students who create their own HyperStudio stacks will have a higher level of achievement than seventh grade social studies students who do not create HyperStudio stacks" was not supported.

Table 2

Pretest and Posttest Means, Standard Deviations, and *t* Tests for the Experimental and Control Groups

	Group		
	HyperStudio Plus Regular Instructional Program[a]	Regular Instructional Program[a]	*t*
Pretest			
American Nation, Form A			
M	40.47	40.00	0.13*
SD	12.86	12.88	
Posttest			
American Nation, Form B			
M	73.88	68.53	1.26*
SD	12.68	12.01	

Note. Maximum Score for both pretest and posttest = 100

[a] $n = 17$

*$p > .05$.

At the completion of the three week study subjects were given an attitudinal survey to complete (Table 3 and 4). It was found that those students who used HyperStudio had a more positive perspective toward their partner, collaborative group work, and social studies in general.

Table 3.

Experimental Group Attitudinal Survey Response.

Issue	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %
I love to work with computers	60%	35%	5%	0%	0%
This class will help me in the future	30%	60%	5%	0%	5%
My partner hindered my performance	18%	0%	20%	12%	50%
The project was a team effort	33%	47%	0%	5%	15%

Table 3 Continued.

Experimental Group Attitudinal Survey Response.

Issue	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %
My partner made it easy to be successful	30%	30%	12%	23%	5%
I think I could have learned more working by myself	30%	30%	25%	0%	15%
I enjoyed working with HyperStudio	60%	25%	10%	5%	0%
The teacher was very knowledgeable and helpful in using HyperStudio	50%	35%	15%	0%	0%

Table 3 Continued.

Experimental Group Attitudinal Survey Response.

Issue	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %
I would like to create more HyperStudio projects in the future	59%	24%	17%	0%	0%
I learned a great deal while working on this project	41%	41%	13%	5%	0%
I found working with HyperStudio very boring	5%	5%	0%	31%	59%

Table 3 Continued.

Experimental Group Attitudinal Survey Response.

Issue	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %
I never thought I would finish this project in time	29%	29%	0%	18%	24%

Table 4.

Control Group Survey Response.

Issue	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %
This class will help me in the future	0%	82%	0%	18%	0%
My partner hindered my performance	0%	5%	30%	35%	30%

Table 4 Continued.

Control Group Attitudinal Survey Response.

Issue	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %
The project was a team effort	5%	59%	5%	31%	0%
My partner made it easy to be successful	15%	15%	15%	25%	30%
I think I could have learned more working by myself	30%	5%	17%	24%	24%
I learned a great deal while working on this project	12%	76%	6%	6%	0%

Table 4 Continued.

Control Group Attitudinal Survey Response.

Issue	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %
I never thought I would finish this project in time	18%	29%	6%	18%	29%

Discussion

The results of this study do not support the original hypothesis: seventh grade social studies students who create their own HyperStudio stacks will have a higher achievement rate on a textbook publisher created test than seventh grade social studies students who do not create HyperStudio stacks. While the mean score of the experimental group's posttest was 5.35 points higher than that of the control group the results were not statistically significant. In this study the students who used HyperStudio as an instructional tool generally did neither better nor worse on a text book publisher created test than those students instructed by traditional methods.

No major, unforeseen events interfered with this study. While some minor disruptions (i.e. an assembly and a field trip) may have interrupted the flow of the experiment, both the control group and the experimental group were effected equally. Student attendance was also excellent throughout the duration of the study.

While great effort was made to control every possible variable, it is important to note that no attempt was made to classify varying student learning styles. Students who are visual learners would probably benefit most from HyperStudio's visually stimulating instructional environment (Erikkson, 1988). Other students may prefer to stay with traditional instruction because they feel more comfortable with it.

A noticeable constraint involved with HyperStudio authoring is the desire to complete the project in a timely fashion. It takes time, energy, knowledge, and resources for teachers to

integrate HyperStudio projects into their curriculums. This can be particularly demanding when curriculums (such as social studies) grow from year to year. The experimental group required three more class periods to complete their projects (due to non content related computer instruction), while no difference was observed in posttest scores. This inevitably brings up the question: "Was the additional time and energy worth the effort?" If one only looks at the final test scores the answer is no.

Although the test results between the experimental and control groups were not statistically significant a difference was found between the attitudes of the two groups. Students in the experimental group generally had a more positive attitude towards social studies, their partner, and cooperative group work. These are three factors that warrant strong consideration. When students are happy, motivated, and engaged in what they are doing meaningful learning can occur. A student body with a positive outlook on their education will no doubt be a tremendous asset to any school district. This may also be of help to some districts with poor attendance rates.

Furthermore, it was informally observed that the HyperStudio instructed students in the experimental group were eager to discover information on their own, were more likely to act as peer tutors, and took more initiative to carry on the learning process outside of scheduled class hours by voluntarily attending extra help sessions, thereby supporting the earlier work of Papert (1987) and Nicol (1989). Students in the experimental group often began to work on their projects before the bell rang to officially start the class period. Students in the control group often

needed to be settled down before their traditional class could begin. As a classroom management tool, HyperStudio was efficient in motivating students to work as well as in keeping them on task.

The attitudinal results of this experiment are consistent with the evidence presented by Volker (1992) and Valasco and Mendivil (1992): that being that students prefer working with multimedia instruments as opposed to traditional instruction. However, these descriptive studies did not focus on a particular topic nor use a t-test as this study did. In the final analysis the results of this experiment support the work of Turner and DiPinto (1992) who informally observed that the hypermedia environment did not seem to enhance content learning of seventh grade science students.

It would be difficult to generalize the results of this study to all classrooms since the study took place in a nearly all white, middle class school district and involved only seventh grade social studies students. Perhaps future research should focus on student attitudes toward using HyperStudio, whether or not students write more when using the authoring tool, how HyperStudio effects long term retention, or if there are any gender differences regarding learning, attitudes, and the use of HyperStudio. These findings will be of great value to educator. Educators should not merely be "doing" technology just because it happens to be in vogue. Educators must have the responsibility to question what is being done and whether or not it is best for students, learning, and education.

HyperStudio is a satisfactory educational tool with applications in nearly all subject areas. While further research

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Appendix

Appendix A: Sample Lesson Plan (Experimental)

Title: The Age of Jefferson (Designing HyperStudio Projects)

Goals & Objectives:

1. Students will understand the Age of Jefferson and its impact on American society
2. Students will identify key people and problems associated with the Age of Jefferson

Teacher Decisions:

1. Three weeks
2. The entire class will work in pairs to complete this project.
3. Supplies needed: Macintosh computers, HyperStudio

Prerequisite Knowledge/Skills: Students will have completed a tutorial on HyperStudio and how to use a Color OneScanner. Research and library skills are also essential.

The Lesson:

Introduction/motivation: Students will be told that they are going to design a HyperStudio program on the Age of Jefferson.

Independent/group practice: Upon the completion and teacher review of the project the HyperStudio copies will be made and installed on computers in the mini-lab. Students will get to view the HyperStudio in small groups. The teacher will develop questions that can be answered from the HyperStudio.

Title: Making Concept Maps

Goals & Objectives:

1. Students will understand the Age of Jefferson and its impact on American society
2. Students will identify key people and problems associated with the Age of Jefferson

Teacher Decisions:

1. Two days
2. The entire class will work in pairs to complete this project.
3. Supplies needed: paper, textbook

Prerequisite Knowledge/Skills: None.

The Lesson:

Introduction/motivation: Students will be given a sheet of paper with the names of government leaders from the Age of Jefferson: Thomas Jefferson, Albert Gallatin, James Madison, John Marshall. Students will then write down major details that they can recall from their textbook that relate to each historical person.

Independent/group practice: Upon the completion and teacher review of the project the HyperStudio copies will be made and installed on computers in the mini-lab. Students will get to view the HyperStudio in small groups. The teacher will develop questions that can be answered from the HyperStudio.

Appendix B: Demographic Survey

Directions – Please answer the following questions honestly.

1. Are you a male or female? _____
2. How old are you? _____
3. Do you own a computer? _____
4. Do you have Internet access? _____
5. Do you subscribe to an online service provider (i.e. America Online, CompuServe, Prodigy, etc.? _____
6. What ethic group do you identify with? _____
7. What social class do you belong to (Upper, Middle, Lower)? - _____

Thank you

Appendix C: Attitudinal Questionnaire & Scoring Key

(for experimental group)

Please respond to the statements below by selecting one of the following:

SA Strongly Agree

A Agree

N Neither agree nor Disagree

D Disagree

SD Strongly Disagree

1. I love to work with computers.

( ) ( ) ( ) ( ) ( )

SA A N D SD

2. This class will help me in the future.

( ) ( ) ( ) ( ) ( )

SA A N D SD

3. My partner hindered my performance.

( ) ( ) ( ) ( ) ( )

SA A N D SD

4. The project was a team effort.

( )	( )	( )	( )	( )
SA	A	N	D	SD

5. My partner made it easy to be successful.

( )	( )	( )	( )	( )
SA	A	N	D	SD

6. I think I could have learned more working by myself.

( )	( )	( )	( )	( )
SA	A	N	D	SD

7. I enjoyed working with HyperStudio.

( )	( )	( )	( )	( )
SA	A	N	D	SD

8. The teacher was very knowledgeable and helpful in using HyperStudio.

( )	( )	( )	( )	( )
SA	A	N	D	SD

9. I would like to create more HyperStudio projects in the future.

( )	( )	( )	( )	( )
SA	A	N	D	SD

10. I learned a great deal while working on this project.

( )	( )	( )	( )	( )
SA	A	N	D	SD

11. I found working with HyperStudio very boring.

( )	( )	( )	( )	( )
SA	A	N	D	SD

12. I never thought I would finish this project in time.

( )	( )	( )	( )
SA	A	N	D

Thank you.

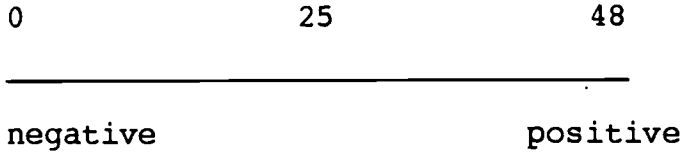
Scoring Guide for the Attitudinal: Experimental Group

Scoring Key for questions:

1, 2, 4, 5, 7, 8, 9, 10, 12			3, 6, 11		
SA	=	4 points	SA	=	0 points
A	=	3	A	=	1
N	=	2	N	=	2
D	=	1	D	=	3
SD	=	0	SD	=	4

1. Add the score of individual surveys.
2. Find the average (mean) score of the group. (Add individual scores together and divide by number in group.)
3. Interpretation of the mean score:

The maximum score is 48 and the minimum is 0. As the mean score increases (greater than 25) the positive feelings toward the treatment also increase.



ATTITUDE

Attitudinal Questionnaire (for control group)

Please respond to the statements below by selecting one of the following:

SA Strongly Agree
A Agree
N Neither agree nor Disagree
D Disagree
SD Strongly Disagree

1. This class will help me in the future.

( ) ( ) ( ) ( ) ( )

SA A N D SD

2. My partner hindered my performance.

( ) ( ) ( ) ( ) ( )

SA A N D SD

3. The project was a team effort.

( ) ( ) ( ) ( ) ( )

SA A N D SD

4. My partner made it easy to be successful.

( )	( )	( )	( )	( )
SA	A	N	D	SD

5. I think I could have learned more working by myself.

( )	( )	( )	( )	( )
SA	A	N	D	SD

6. I learned a great deal while working on this project.

( )	( )	( )	( )	( )
SA	A	N	D	SD

7. I never thought I would finish this project in time.

( )	( )	( )	( )	( )
SA	A	N	D	SD

Thank you.

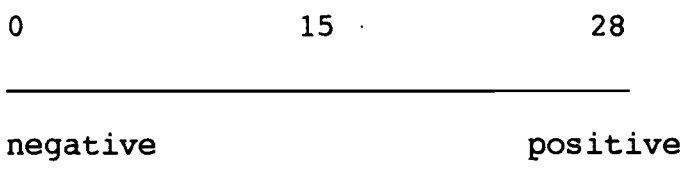
Scoring Guide for the Attitudinal: Control Group

Scoring Key for questions:

1, 3, 4, 6			2, 5, 7		
SA	=	4 points	SA	=	0 points
A	=	3	A	=	1
N	=	2	N	=	2
D	=	1	D	=	3
SD	=	0	SD	=	4

1. Add the score of individual surveys.
2. Find the average (mean) score of the group. (Add individual scores together and divide by number in group.)
3. Interpretation of the mean score:

The maximum score is 28 and the minimum is 0. As the mean score increases (greater than 15) the positive feelings toward the treatment also increase.



Appendix D: Pretest/Post Grades Grades

Pretest Grades

Student	Experimental	Control
1	27	44
2	71	33
3	36	50
4	25	57
5	40	35
6	34	46
7	33	27
8	33	43
9	30	21
10	27	21
11	42	24
12	61	55
13	47	48
14	55	33
15	49	30
16	33	57
17	45	56

Appendix E: Continued: Pretest/Post Grades Grades

Posttest Grades

Student	Experimental	Control
1	70	77
2	97	62
3	72	82
4	50	69
5	82	67
6	62	62
7	60	56
8	65	56
9	91	48
10	59	76
11	91	73
12	71	57
13	82	60
14	74	78
15	80	88
16	80	64
17	70	90

Appendix F: Pretest/Posttest Results

STATPAK PRINTOUTS

Pretest Grades

Descriptive Statistics

Experimental Group (Pretest)

STANDARD DEVIATION FOR SAMPLES AND POPULATIONS

STATISTIC	VALUE
NO. OF SCORES (N)	17
SUM OF SCORES ($\sum X$)	688.00
MEAN (X)	40.47
SUM OF SQUARED SCORES ($\sum X^2$)	30488.00
SUM OF SQUARES (SS)	2644.24
STANDARD DEVIATION FOR A POPULATION	12.47
STANDARD DEVIATION FOR A SAMPLE	12.86

STATPAK PRINTOUTS

Pretest Grades

Descriptive Statistics

Control Group (Pretest)

STANDARD DEVIATION FOR SAMPLES AND POPULATIONS

STATISTIC	VALUE
NO. OF SCORES (N)	17
SUM OF SCORES ($\sum X$)	680.00
MEAN (X)	40.00
SUM OF SQUARED SCORES ($\sum X^2$)	29854.00
SUM OF SQUARES (SS)	2654.00
STANDARD DEVIATION FOR A POPULATION	12.49
STANDARD DEVIATION FOR A SAMPLE	12.88

STATPAK PRINTOUTS

Pretest

Inferential Statistics

t-TEST FOR INDEPENDENT SAMPLES

(PRETEST)

STATISTIC	VALUE
NO. OF SCORES IN GROUP ONE	17
SUM OF SCORES IN GROUP ONE	690.00
MEAN OF GROUP ONE	40.59
SUM OF SQUARED SCORES IN GROUP ONE	30624.00
SS OF GROUP ONE	2618.12
NO. OF SCORES IN GROUP TWO	17
SUM OF SCORES IN GROUP TWO	680
MEAN OF GROUP TWO	40.00
SUM OF SQUARED SCORES IN GROUP TWO	29854.00
SS OF GROUP TWO	2654.00
t-VALUE	0.13
DEGREES OF FREEDOM (Df)	32

STATPAK PRINTOUTS

Posttest

Descriptive Statistics

Experimental Group (Posttest)

STANDARD DEVIATION FOR SAMPLES AND POPULATIONS

STATISTIC	VALUE
NO. OF SCORES (N)	17
SUM OF SCORES ($\sum X$)	1256.00
MEAN (X)	73.88
SUM OF SQUARED SCORES ($\sum X^2$)	95370.00
SUM OF SQUARES (SS)	2573.76
STANDARD DEVIATION FOR A POPULATION	12.30
STANDARD DEVIATION FOR A SAMPLE	12.68

STATPAK PRINTOUTS

Pretest Grades

Descriptive Statistics

Control Group (Posttest)

STANDARD DEVIATION FOR SAMPLES AND POPULATIONS

STATISTIC	VALUE
NO. OF SCORES (N)	17
SUM OF SCORES ($\sum X$)	1165.00
MEAN (X)	68.53
SUM OF SQUARED SCORES ($\sum X^2$)	82145.00
SUM OF SQUARES (SS)	2308.24
STANDARD DEVIATION FOR A POPULATION	11.65
STANDARD DEVIATION FOR A SAMPLE	12.01

STATPAK PRINTOUTS

Posttest

Inferential Statistics

t-TEST FOR INDEPENDENT SAMPLES

(POSTTEST)

STATISTIC	VALUE
NO. OF SCORES IN GROUP ONE	17
SUM OF SCORES IN GROUP ONE	1256.00
MEAN OF GROUP ONE	73.88
SUM OF SQUARED SCORES IN GROUP ONE	95370.00
SS OF GROUP ONE	2573.76
NO. OF SCORES IN GROUP TWO	17
SUM OF SCORES IN GROUP TWO	1165.00
MEAN OF GROUP TWO	68.53
SUM OF SQUARED SCORES IN GROUP TWO	82145.00
SS OF GROUP TWO	2308.24
t-VALUE	1.26
DEGREES OF FREEDOM (D*f*)	36

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